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PROCESS FOR MATCHING A NUMBER N OF RECEPTION TERMINALS
WITH A NUMBER M OF CONDITIONAL ACCESS CONTROL CARDS

DISCLOSURE

Technical field

The invention is in the field of security of broadcast digital data and reception equipment that will receive these data in a data and/or services distribution network and is more specifically related to a method for matching a number N of data reception equipment with a number M of external security modules, each reception equipment being provided with a unique identifier, and each external security module having a unique identifier.

The invention also relates to reception equipment that can be matched with a plurality of external security modules to manage access to digital data distributed by an operator.

State of the prior art

More and more operators are offering data and on-line services accessible from terminals provided with security processors. In general, distributed data and services are scrambled when being sent by using secret keys, and are descrambled on reception using the same secret keys previously provided to the subscriber.

Apart from classical access control techniques based on scrambling when sending and descrambling on reception of the distributed data, operators propose techniques based on matching of the reception terminal with a security processor to prevent the distributed data and services from being accessible to users who are using a stolen terminal or a pirated card.

Document WO 99 57901 describes a matching mechanism between a receiver and a security module based firstly on encryption and decryption of information exchanged between the receiver and the security module by a unique key stored in the receiver or in the security module, and secondly on the presence of a receiver number in the security module.

One disadvantage of this technique is due to the fact that the association between a receiver and the security module matched to it is set up in advance, and the operator cannot efficiently manage his collection of reception equipment to prevent this equipment being used improperly for fraudulent purposes.

One purpose of the matching method according to the invention is to enable each operator to limit use of his collection of reception equipment by dynamically controlling configuration of the reception equipment

and external security modules that will cooperate with this equipment.

Presentation of the invention

5 The invention recommends a method for matching a number N of data reception equipment with a number M of external security modules, each reception equipment being provided with a unique identifier, and each external security module having a unique identifier,
10 this method comprising a configuration phase and a check phase.

According to the invention, the configuration phase comprises the following steps:

- memorising a list of identifiers of reception
15 equipment in each external security module,
- memorising a list of identifiers of external security module in each reception equipment,

and the check phase consists of authorising access to data if the identifier of an external security
20 module connected to a reception equipment is present in the list memorised in this reception equipment, and if the identifier of said reception equipment is present in the list memorised in said external security module, otherwise disturb access to said data.

25 Preferably, the configuration is used only when the user connects an external security module to a reception equipment.

In one preferred embodiment, the method according to the invention comprises a step in which the operator
30 transmits a signal to the reception equipment to manage

the check phase comprising at least one of the following set values:

- activating the check phase at a programmed date or after a programmed delay,
- 5 - deactivating the check phase at a programmed date or after a programmed delay,
- specifying an absolute date (or a delay) starting from which (or after which) the check phase is activated or deactivated,
- 10 - cancelling said programmed date (or said programmed delay).

In a first variant, the operator also transmits a signal to the reception equipment containing a message to delete the list of identifiers memorised in the
15 reception equipment.

Said signal message is transmitted to said reception equipment through an EMM (Entitlement Management Message) specific to this reception equipment.

20 This signal may be transmitted to a group of reception equipment through an EMM message specific to said group of reception equipment.

In a second variant, the operator also transmits a signal to the external security module containing a
25 message to delete the list of identifiers memorised in this external security module. Said signal message is transmitted to said external security module through a specific EMM message, and can be transmitted to a group of external security modules through an EMM message
30 specific to said group of external security modules.

According to another characteristic of the method according to the invention, the operator transmits firstly the list of M identifiers of external security modules to a reception equipment through an EMM message specific to said reception equipment, and secondly the list of N identifiers of reception equipment to an external security module through an EMM message specific to said external security module.

According to another variant, the operator transmits firstly the list of M identifiers of external security module to a group of reception equipment through an EMM message specific to the group of reception equipment, and secondly the list of N identifiers of reception equipment to a group of external security modules through an EMM message specific to said group of external security modules.

In another variant embodiment, the operator transmits a signal message for the check phase to a group of reception equipment in a private flow that is processed by a dedicated software executable in each reception equipment as a function of the identifier of said reception equipment.

Alternately, the list of identifiers of external security module is transmitted in a private flow to a group of reception equipment and is processed by a dedicated software executable in each reception equipment as a function of the identifier of said reception equipment, and the list of identifiers of reception equipment is transmitted to a group of external security modules in a private flow that is processed by a dedicated software executable in each of

said external security modules or in the reception equipment to which one of said external security modules is connected, as a function of the identifier of said external security module.

5 In one example application of the method according to the invention, the digital data represent audiovisual programs distributed in plain text or in scrambled form.

10 According to another characteristic, the list of identifiers of the M security modules memorised in a reception equipment is encrypted, and the list of identifiers of the N reception equipment memorised in an external security module is encrypted.

15 Advantageously, the method according to the invention also includes a mechanism designed to prevent use of an EMM transmitted to the same external security module or to the same reception equipment.

EMM messages specific to a security module or a reception equipment are in the following format:

20

```
EMM-U_section() {  
    table_id = 0x88                8 bits  
    section_syntax_indicator = 0    1 bit  
    DVB_reserved                   1 bit  
25    ISO_reserved                  2 bits  
    EMM-U_section_length           12 bits  
    unique_address_field           40 bits  
    for (i=0; i<N; i++) {  
        EMM_data_byte              8 bits  
30    }  
}
```

EMM messages specific to all external security modules or to all reception equipment are in the following format:

```

5      EMM-G_section() {
        table_id = 0x8A ou 0x8B           8 bits
        section_syntax_indicator = 0      1 bit
        DVB_reserved                      1 bit
        ISO_reserved                      2 bits
10     EMM-G_section_length              12 bits
        for (i=0; i<N; i++) {
            EMM_data_byte                 8 bits
        }
    }

```

15 EMMs specific to a sub-group of external security modules or a sub-group of reception equipment are in the following format:

```

        EMM-S_section() {
20     table_id = 0x8E                   8 bits
        section_syntax_indicator = 0      1 bit
        DVB_reserved                     1 bit
        ISO_reserved                     2 bits
        EMM-S_section_length             12 bits
25     shared_address_field              24 bits
        reserved                         6 bits
        data_format                      1 bit
        ADF_scrambling_flag              1 bit
        for (i=0; i<N; i++) {
30         EMM_data_byte                 8 bits
        }
    }

```

}

The method according to the invention is used in an access control system containing a plurality of reception equipment each with a unique identifier and capable of cooperating with a plurality of external security modules each with a unique identifier, each external security module containing information about a subscriber's access rights to digital data distributed by an operator, this system also including a commercial management platform communicating with said reception equipment and with said external security modules. This system also includes:

- a first module arranged in said commercial management platform and designed to generate matching queries,

- and a second module arranged in said reception equipment and external security modules and designed to process said queries to prepare a matching configuration.

The method according to the invention can be used in an architecture in which the reception equipment includes a decoder and the external security module comprises an access control card in which information about a subscriber's access rights to digital data distributed by an operator are memorised. In this case, matching is done between said decoder and said card.

Alternately, the method according to the invention can be used in an architecture in which the reception equipment includes a decoder and the external security module includes a removable security interface provided with a non-volatile memory and designed to cooperate

firstly with the decoder, and secondly with a plurality of conditional access control cards to manage access to digital data distributed by an operator. In this case, matching is done between said decoder and said removable security interface.

The method according to the invention can also be used in an architecture in which the reception equipment includes a decoder provided with a removable security interface with a non-volatile memory designed to cooperate firstly with said decoder and secondly with a plurality of conditional access control cards. In this case, matching is done between said removable security interface and said access control cards.

The invention also relates to reception equipment that can be matched with a plurality of external security modules to manage access to digital data distributed by an operator. This reception equipment includes:

- a non-volatile memory designed to memorise a list of external security modules.

- means of verifying if the identifier of an external security module connected to said equipment is present in the list memorised in said non-volatile memory.

In a first embodiment, this reception equipment includes a decoder and the external security module is an access control card containing information about the access rights of a subscriber to said digital data, matching being done in this case between said decoder and said card.

In a second embodiment, this reception equipment includes a decoder and the external security module is a removable security interface provided with a non-volatile memory that will cooperate firstly with said decoder and secondly with a plurality of conditional access control cards to manage access to said digital data, matching being done in this case between said decoder and said removable security interface.

In a third embodiment, this reception equipment includes a decoder provided with a removable security interface with a non-volatile memory and that will cooperate firstly with said decoder and secondly with a plurality of conditional access control cards and matching is done between said removable security interface and said access control cards

The invention also relates to a decoder that can cooperate with a plurality of external security modules to manage access to audiovisual programs distributed by an operator, each external security module having a unique identifier and comprising at least one data processing algorithm. This decoder comprises:

- a non-volatile memory that will memorise a list of external security modules,
- means of verifying if the identifier of an external security module connected to said decoder is present in the list memorised in said non-volatile memory.

In a first variant, said external security modules are access control cards in which information about access rights of a subscriber to digital data distributed by an operator are memorised.

In a second variant, said external security modules are removable security interfaces comprising a non-volatile memory and designed to cooperate firstly with the decoder and secondly with a plurality of conditional access control cards to manage access to digital data distributed by an operator.

The invention also relates to a removable security interface designed to cooperate firstly with a reception equipment and secondly with a plurality of conditional access control cards, to manage access to digital data distributed by an operator, each card having a unique identifier and containing information about access rights of a subscriber to said digital data.

This interface comprises:

- a non-volatile memory that will be used to memorise a list of subscriber cards,
- means of verifying if the identifier of a card associated with said interface is present in the list memorised in said non-volatile memory.

In a first example embodiment, the removable interface is a PCMCIA (Personal Computer Memory Card International Association) card including a digital data descrambling software.

In a second example embodiment, the removable interface is a software that can be executed either in the reception equipment or in an access control card.

The process is controlled by a computer program executable on N reception equipment that can be matched with M external security modules each with a unique identifier and in which information about access rights

of a subscriber to digital data distributed by an operator are stored, this program comprises instructions for memorising a list of identifiers of part or all of N reception equipment in each external security module, and instructions to memorise a list of identifiers of part or all of the M external security modules in each reception equipment, instructions to control the identifier of an external security module connected to a reception equipment and the identifier of said reception equipment, and instructions to prevent access to said data if the identifier of the external security module connected to the reception equipment is not present in the list of identifiers previously memorised in this reception equipment or if the identifier of said reception equipment is not present in the list of identifiers previously memorised in said external security module.

Brief description of the drawings

Other characteristics and advantages of the invention will become clear from the following description given as a non-limitative example with reference to the appended figures in which:

- figure 1 shows a first system architecture for use of matching according to the invention,
- figure 2 shows a second system architecture for use of matching according to the invention,
- figure 3 shows a third system architecture for use of matching according to the invention,

- figure 4 shows the structure of EMM_decoder messages for configuration and use of matching functions according to the invention,

5 - figure 5 shows the structure of EMM_card messages for configuration of matching functions according to the invention,

- figure 6 is a functional diagram schematically showing the states of the matching function onboard a reception equipment,

10 - figure 7 shows a flowchart illustrating a particular embodiment of use of matching according to the invention.

Detailed description of particular embodiments

15 The invention will now be described within the framework of an application in which an operator broadcasting audiovisual programs uses the method according to the invention to limit use of his reception equipment to his own subscribers.

20 The method may be used in three distinct architectures shown in figures 1, 2 and 3 respectively. Identical elements in these three architectures are denoted by identical references.

Management of matching is done from a commercial
25 platform 1 controlled by the operator and communicating with reception equipment installed at the subscriber.

In the first architecture shown in figure 1, the reception equipment includes a decoder 2 in which an access control software 4 is installed, and the
30 external security module is an access control card 6 containing information about access rights of a

subscriber to broadcast audiovisual programs. In this case, matching is done between the decoder 2 and the card 6.

In the second architecture shown in figure 2, the reception equipment includes a decoder 2 not dedicated to access control, and the external security module is a removable security interface 8 provided with a non-volatile memory and in which the access control software 4 is installed. This interface 8 cooperates firstly with said decoder 2, and secondly with a card 6 among a plurality of conditional access control cards, to manage access to said audiovisual programs.

In this architecture, matching is done between said removal security interface 8 and said access control card 6.

In the third architecture shown in figure 3, the reception equipment includes a decoder 2 in which an access control software 4 is installed, and which is connected to a removable security interface 8 with a non-volatile memory designed to cooperate firstly with said decoder 2, and secondly with a card 6 among a plurality of conditional access control cards.

In this case, matching is done between the decoder 2 and the removable security interface 8.

The configuration and use of matching by the operator is the result of commands sent by the commercial management platform 1 installed at the operator.

The following description relates to use of the invention in the case of matching of N dedicated

decoders 2 with M cards 6. The steps used are applicable to the three architectures described above.

All matching processing is inactive when N decoders 2 leave the factory, and also after access control software 4 has been downloaded into each decoder 2. In particular:

- no card identifier is memorised in the decoders 2,
- check of card identifiers 6 by the decoders 2 is not active,
- check by decoders 2 that the presence of their own identifier in cards 6 is not active.

Similarly, when the M cards 6 leave the factory, there is no decoder identifier 2 memorised in the cards 6.

Matching can then be configured and used in the N decoders 2 and in the M cards 6 by a query from the operator through the management platform 1 that sends:

- EMM_decoder messages dedicated to matching, to the N decoders 2.
- EMM_card messages dedicated to matching, to the M cards 6. These EMM_card messages are sent to the cards 6 directly or are integrated into EMM_decoder messages.

EMM_decoder messages perform the following tasks:

- activate the matching function in the N decoders 2. In this case, each decoder verifies if the identifier of a card 6 inserted in the decoder card reader forms part of the identifiers that it memorised and that the identifier of this decoder 2 forms part of the identifiers of decoders memorised in this card 6.

If this is not the case, a disturbance is applied in the access to data.

- deactivate the matching function in the N decoders 2. In this case, each decoder 2 does not check its identifier or the identifier of the card.

- load the list of M identifiers of cards 6 matched to the N decoders 2, into these decoders.

- erase identifiers of cards 6 already memorised in the N decoders 2.

10 EMM_card messages:

- load the list of N identifiers of decoders 2 matched to these cards, in the M cards 6.

- erase the identifiers of decoders 2 already memorised in the M cards 6.

15

Addressing of EMM messages

EMM messages used for configuration and use of functions related to matching according to the method according to the invention are sent in an EMM channel of a digital multiplex as defined by the MPEG2/System standard and DVB/ETSI standards.

This channel can broadcast EMMs referencing a card address so that they can be addressed directly to:

- a particular card,
- 25 - cards in a particular group,
- all cards,

This channel can also broadcast EMMs referencing a decoder address so that they can be addressed directly to:

- 30 - a particular decoder,
- a particular group of decoders,

- all decoders,

Messages intended for a particular card or for a particular decoder are EMM-U messages with the following structure:

```

5      EMM-U_section() {
        table_id = 0x88                      8 bits
        section_syntax_indicator = 0        1 bit
        DVB_reserved                        1 bit
        ISO_reserved                        2 bits
10     EMM-U_section_length                12 bits
        unique_address_field                40 bits
        for (i=0; i<N; i++) {
            EMM_data_byte                    8 bits
        }
15     }

```

The unique_address_field parameter is the unique address of a card in a card EMM-U or the unique address of a decoder in a decoder EMM-U.

Messages intended for cards in a particular group of cards or decoders in a particular group of decoders are EMM-S messages with the following structure:

```

      EMM-S_section() {
        table_id = 0x8E                      8 bits
        section_syntax_indicator = 0        1 bit
25     DVB_reserved                        1 bit
        ISO_reserved                        2 bits
        EMM-S_section_length                12 bits
        shared_address_field                24 bits
        reserved                            6 bits
30     data_format                        1 bit

```

```

ADF_scrambling_flag          1 bit
for (i=0; i<N; i++) {
    EMM_data_byte            8 bits
}
5      }

```

The `shared_address_field` parameter is the address of the group of cards in a card EMM-S or the address of the group of decoders in a decoder EMM-S. A decoder in a group or a card in a group is concerned by the message if it is also explicitly designated in an ADF field contained in `EMM_data_byte` and that can be encrypted using the `ADF_scrambling_flag` information.

Messages intended for all cards or all decoders are EMM-G messages with the following structure:

```

15      EMM-G_section() {
        table_id = 0x8A ou 0x8B          8 bits
        section_syntax_indicator = 0      1 bit
        DVB_reserved                     1 bit
        ISO_reserved                     2 bits
20      EMM-G_section_length             12 bits
        for (i=0; i<N; i++) {
            EMM_data_byte                8 bits
        }
    }

```

25 Content of decoder EMM messages

Figure 4 diagrammatically shows the content of `EMM_data_byte` data in a matching `EMM_decoder` message. This content depends on the function to be executed by a decoder 2 for configuration or use of matching.

30 `EMM_data_byte` data include the following functional parameters:

- ADF 20: address complement of a decoder in a group of decoders; this parameter is useful for addressing by group, otherwise it can be omitted; it can be encrypted.
- 5 - SOID 22: identification of matching message according to the invention, among other types of messages.
- OPID/NID 24: identification of the group of decoders and the operator's signal.
- 10 - TIME 26: time dating data for sending the message; this parameter is used to avoid the need to replay the message by the same decoder
- CRYPTO 28: identification of cryptographic protection functions applied to FUNCTIONS parameters
- 15 32; FUNCTIONS parameters can be encrypted and protected by a cryptographic redundancy 30.
- FUNCTIONS 32: all parameters describing the configuration and use of matching.
- STBID 34: unique address of the decoder
- 20 concerned by the message. This parameter is present in a decoder EMM-U, otherwise it can be omitted.

The above functional parameters are freely organised in the EMM_data_byte data of an EMM_decoder message. One preferred implementation is the

25 combination of these parameters by a T L V (Type Length Value) structure.

Content of card EMM messages

Figure 5 diagrammatically shows the content of EMM_data_byte data in a matching EMM_Card message. This

30 content is used to write, modify or erase a list of terminal identifiers.

EMM_data_byte data include the following functional parameters:

- SOID 40: operator identification.
- ADF 42: address complement of a card in a group of cards; this parameter is useful when addressing by group, otherwise it can be omitted; it can be encrypted.
- CRYPTO 44: identification of cryptographic protection functions applied to the LDA parameter 48 and to other parameters 50; parameters 48 and 50 can be encrypted and protected by cryptographic redundancy 46.
- LDA 48 (List of authorised decoders): this parameter contains the list of decoder identifiers with which the card can operate.

EMM_data_byte data can also contain other parameters 50 concerning functions of the card other than matching.

Parameters in the EMM_data_byte data are freely organised in these data of a card EMM message. One preferred implementation is the combination of these parameters by a T L V (Type Length Value) structure.

Configuration and use of matching

The complete set of all FUNCTIONS parameters 32 in an EMM_decoder describes the configuration and use of matching according to the invention. This set of parameters is an arbitrary combination of the following functional parameters:

- MODE: this parameter activates, deactivates or reinitialises the matching solution according to the invention. After deactivation, the decoder does not

check the identifier of a card inserted, but keeps the list of memorised identifiers. After reinitialisation, the decoder does not check the identifier of an inserted card and no longer has any memorised card identifiers:

- LCA (List of authorised cards): this parameter loads the list of card identifiers with which it can operate, in a decoder

- Disturbance: this parameter describes the disturbance to be applied by the decoder in the data access in the case of a card not matched with the decoder:

- Date/Delay: this parameter characterises the matching activation or deactivation date or delay.

The above functional parameters are freely organised in all FUNCTIONS parameters 32. One preferred implementation is the combination of these parameters by a T L V (Type Length Value) structure.

Furthermore, in some types of service such as a form of matching a decoder with a card, an EMM_decoder can transport one or several EMM_cards. In this case, the EMM_card(s) is (are) included in the set of FUNCTIONS parameters 32 in a manner that can be clearly identified by the decoder that can extract and provide the EMM_card(s) to the inserted card. One preferred implementation to include EMM_card in the set of FUNCTIONS parameters 32 of an EMM_decoder is to use a particular T L V structure containing EMM_card(s) with all related addressing data.

Another use of EMM_card in an EMM_decoder is to memorise that this EMM_decoder has already been

processed by the decoder, in the card, so as to avoid a replay on another decoder so that this EMM can be processed once only by a single decoder; semantically, these data mean « Already processed » and are verified by the access control software 4 of the decoder 2 when it processes this EMM. One preferred embodiment of this anti-replay mechanism is to write these data in a FAC (Facilities Data Block) data block on the card.

10 Operation

Operation of matching according to the invention will now be described with reference to figures 6 and 7.

Figure 6 is a functional diagram diagrammatically showing states of the matching function of the access control software 4 onboard a decoder 2.

The matching function is in the inactive state 60 when the access control software 4 has just been installed or downloaded 61, or when it has received a deactivate matching order 62 or reinitialise matching order 64 from the management platform 1. In this state, the access control software 4 will operate with a card 6 inserted in the decoder 2 without verifying matching with this card.

25 In order to activate matching between M decoders 2 and N cards 6, the operator activates the following through the management platform 1:

- processing 70 to define the matching mode (= active), and the applicable disturbance type in access to data if matching fails,

- processing 72 to define the LCA list to be loaded in these N decoders of identifiers of M authorised cards,

5 - processing 74 to define the LDA list to be loaded in these M cards of identifiers of N authorised decoders

Depending on this information, the management platform 1 generates and sends (arrow 76):

10 • at least one EMM_decoder message to load the LCA list of authorised cards 6 into the non-volatile memory of the N decoders 2.

 • at least one EMM_card message to load the LDA list of authorised decoders into the non-volatile memory of M cards 6

15 • at least one EMM_decoder message to load configuration parameters into the non-volatile memory of the N decoders 2.

The matching function in a decoder 2 changes to the active state 78.

20 During activation of the matching function in a decoder 2 with loading of the LCA list of authorised cards 6 and/or the LDA list of authorised decoders 2, the configuration parameters may be taken into account by a decoder 2 with a time delay defined by the
25 Date/Delay parameter to guarantee effective loading of the LCA list of authorised cards 6 into a decoder 2 and the LDA list of authorised decoders 2 in a card 6.

 During reactivation of the matching function in a decoder 2, if the LCA list of authorised cards 6 and/or
30 the LDA list of authorised decoders 2 does not have to

be changed, the corresponding EMMs are neither generated nor sent.

The operator may deactivate (step 80) matching in a decoder 2, from the management platform 1 that generates and sends (arrow 82) an EMM message addressing the decoder(s) 2 concerned and containing a deactivation order without erasing the matching context 62 or a RESET order of the matching context 64.

The matching function in a decoder 2 changes to the inactive state 60.

Effective acceptance of the deactivation order by a decoder 2 may be delayed in time as defined by the Date/Delay parameter.

Regardless of the state of a matching function, either inactive 60 or active 78, it may receive a list of authorised LCA cards 6 through the decoder EMM (step 72) or a list of authorised LDA decoders 2 (step 74) from the management platform 1.

Acceptance of one of the M cards 6 by the matching function of one of N decoders 2 is described in the flowchart in figure 7.

When a card 6 is inserted (step 100) into the decoder 2, the onboard access control software 4 in the decoder tests (step 102) if the matching function is in the active state 78.

If the matching function in the decoder is in the inactive state 60, the decoder will operate with the inserted card (108).

If the matching function in the decoder is in the active state 78, the access control software:

- reads the identifier of the inserted card and verifies (step 104) if this identifier is in the list of authorised cards 6 memorised in the decoder 2,

5 • reads the list of authorised decoders in the inserted card and verifies (step 106) if the identifier of the decoder 2 is present in this list,

The tests 104 and 106 may be executed in any
10 order.

If the results of these two identifier tests 104 and 106 are positive, the access control software 4 accepts to operate with the inserted card 6 (step 108). Broadcast programs can then be accessed, provided that
15 other access conditions attached to these programs are conform.

If the result of at least one of the tests 104 and 106 is not positive, the access control software 4 refuses to operate with the inserted card 6 and applies
20 (step 110) the disturbance in data access as defined by the operator. Such a disturbance may consist of blocking access to broadcast programs. It may be accompanied by a message prompting the subscriber to insert another card 6 in the decoder 2, being displayed
25 on the screen of the terminal with which the decoder is associated.

When the card 2 is extracted (step 112) from the decoder 2, the access control software starts waiting for a card to be inserted (step 100)

The disturbance applied in step 110 in access to data in the case of a matching fault may be of different natures, such as:

- Stop audio and video on encrypted channels
5 (obtained by not submitting ECMs to the card to calculate CWs) ;
- Stop audio and video on plain text and analogue channels (obtained by a message to the middleware) ;
- Send a message to the terminal middleware
10 (example: Open TV message).

This disturbance may also be used to block stolen decoders.

In the case described in figure 2 in which the access control software 4 is executed in the removable
15 interface 8 connected to a decoder 2, the logic controller described in figure 4 and the flowchart described in figure 5 are applicable directly to the onboard access control software 4 in this removable interface 8.